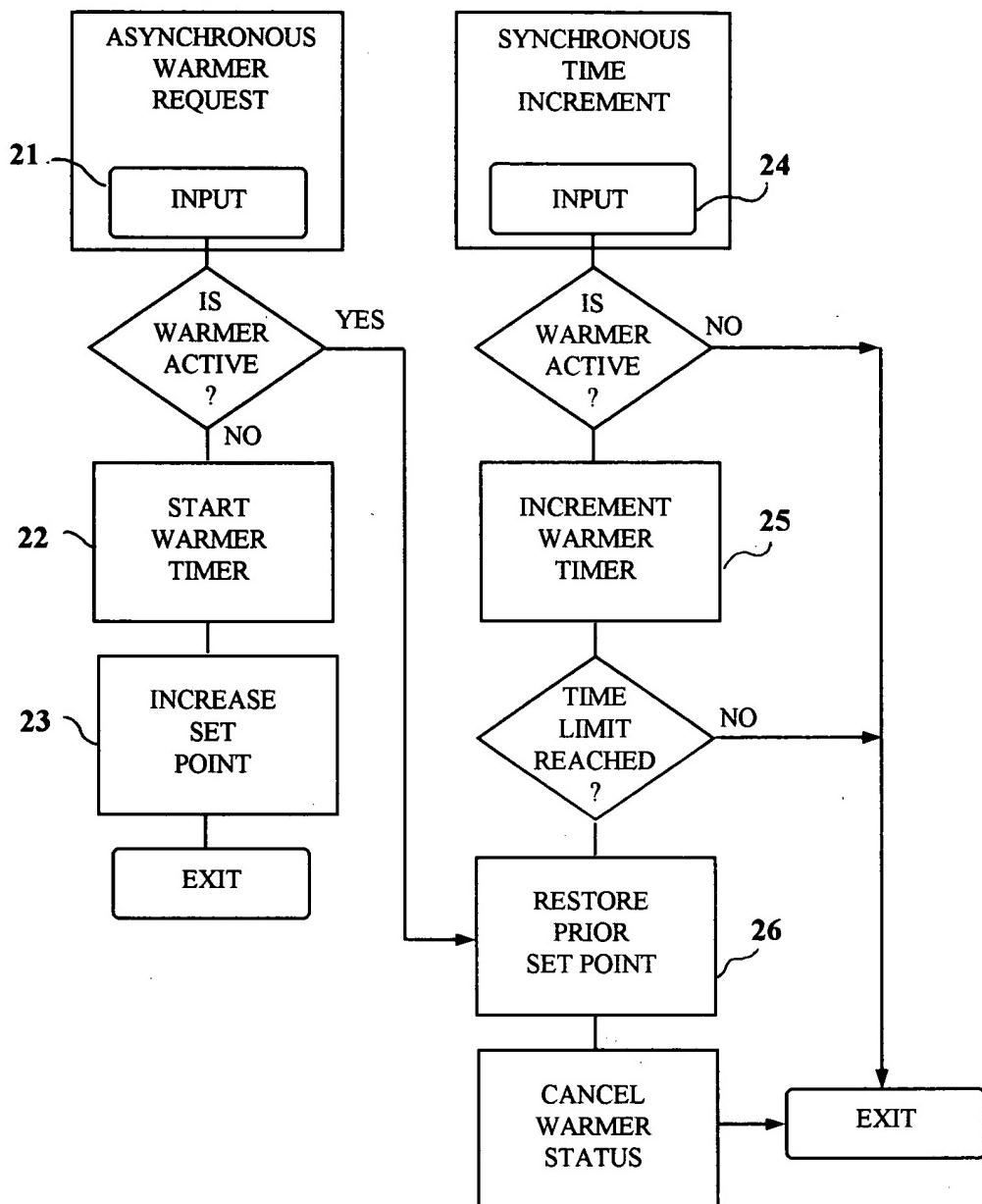


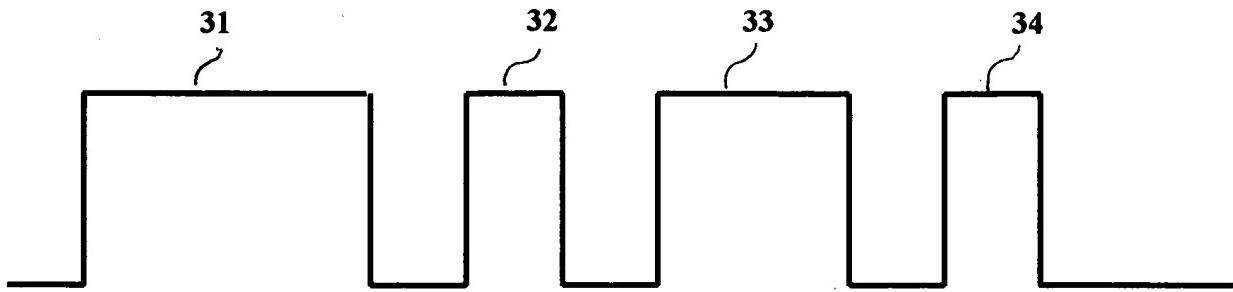
**FIGURE 1**

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**FIGURE 2**

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**FIGURE 3**

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Warmer

```
    movlw 0x20
    xorwf Tcontrol,f      ;flip warmer status
    btfss Tcontrol,WarmON
    goto FinishWarm
```

WarmUp

```
    incf CT1,f
    movlw d'90'           ; set timer for 90 minutes
    movwf WarmTime
    ; change display line 2 and show
```

WarmChange

```
    call readTC77
    call Warm_Message
    call display_lcd
    bsf     BkLt
    movlw   d'60'
    goto   Vtime
```

FinishWarm

```
    decf CT1,f
    clrf WarmTime
    goto WarmChange
```

CheckWarm

```
    btfss Tcontrol,WarmON ;check if warm on
    return                 ;exit if not
    decfsz WarmTime,f    ;reduce time to go by one minute
    return
    goto Warmer          ;if zero time, reset
```

KillWarm

```
    btfsc Tcontrol,WarmON ;check if warm on
    decf CT1,f            ;if Warm was on, decrease current set
    bcf     Tcontrol,WarmON ;ensure Warm status is off
    clrf   WarmTime        ;ensure Warm timer is zero
    return
```

**FIGURE 4**

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## TRANSMIT

-----Send 1.5ms Synch Pulse-----  
bsf TrOut ;set output line high  
movlw d'250'  
movwf Timex  
call Tdelay ;six times value in Timex  
call SendLow ;set output low for 1/2 ms

-----Send Data-----

ExamHeat  
btfsc Tcontrol,HeatON ;check for call for heat  
goto SendHeat  
call SendZero  
goto ExamAC

SendHeat  
call SendOne

ExamAC  
btfsc Tcontrol,CoolON ;check for call for A/C  
goto SendCool ;If calling, send cool signal  
call SendZero  
goto ExamFan

SendCool  
call SendOne  
goto SendFan ;If cool call, also turn fan on.

ExamFan  
btfsc Tmode,FanMode ;check for call for fan  
goto SendFan  
goto SendZero

SendFan  
SendOne bsf TrOut ;set output line high  
call HalfMs ;send synch phase of pulse  
;-----send .5 ms high followed by .5 ms low

SendZero bsf TrOut ;set output line high  
Sendmore call HalfMs ;maintain line level for half ms  
SendLow bcf TrOut ;set output line low  
HalfMs movlw d'83' ;set wait period for 1/2 ms  
movwf Timex ; 1  
Tdelay nop ;burn a cycle for correct timing 1N  
goto Tdly ;2 more microseconds 2N  
Tdly decfsz Timex,f ;count down to correct time 1N  
goto Tdelay ; 2N  
return

**FIGURE 5**

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-----FINDDATA routine: reads data from upper unit-----

MAIN	clr f	DataBuf	
	btfss	Input	;test com line for high level
	goto	MAIN	;must find high level to start
FINDDATA			
	movlw	3	
	movwf	BitCount	;set up number of bits to get
	clrf	Futil	
	call	HiTime	;look for start pulse
	addwf	Futil,w	;check return code
	btfsc	STATUS,2	;abnormal return code is zero, which sets carry
	goto	MAIN	;start fresh if time exceeded
	movlw	d'128'	;see if pulse is at least 1280us
	subwf	Timex,w	
	btfss	STATUS,0	;carry set means pulse > 1.28 ms
	goto	MAIN	;invalid start pulse if < 1.28 ms
	movlw	d'172'	;see if pulse is under 1720us
	subwf	Timex,w	
	btfsc	STATUS,0	;carry set means pulse > 1.72 ms
	goto	MAIN	;invalid start pulse if > 1.72 ms
	;		VALID START FOUND - 1.5 ms (+/- 15%)
GetaBit	call	LoTime	;check pre-data interval
	addwf	Futil,w	;check return code
	btfsc	STATUS,2	;abnormal return code is zero, which sets carry
	goto	MAIN	;start fresh if time exceeded
	movlw	d'40'	;see if pulse is at least 400us
	subwf	Timex,w	
	btfss	STATUS,0	;carry set means pulse > 0.4 ms
	goto	MAIN	;invalid start pulse if < 0.4 ms
	;		;
	movlw	d'60'	;see if pulse is under 600us
	subwf	Timex,w	
	btfsc	STATUS,0	;carry set means pulse > 0.6 ms
	goto	MAIN	;invalid start pulse if > 0.4 ms
	;		VALID INTERVAL FOUND
	call	HiTime	;measure data pulse
	addwf	Futil,w	;check return code
	btfsc	STATUS,2	;abnormal return code is zero, which sets carry
	goto	MAIN	;start fresh if time exceeded
	movlw	d'40'	;see if pulse is at least 400us
	subwf	Timex,w	
	btfss	STATUS,0	;carry set means pulse > 0.4 ms
	goto	MAIN	;invalid data pulse if < 0.4 ms

FIGURE 6

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```
movlw d'60'          ;see if data pulse is under 600us
subwf Timex,w
btfs STATUS,0
goto SetZero          ;carry set means data > 0.6 ms
                      ;data bit is zero if .6ms > data > 0.4 ms

movlw d'85'          ;see if pulse is at least 850us
subwf Timex,w
btfs STATUS,0
goto MAIN             ;carry set means pulse > 0.85 ms
                      ;invalid data pulse if < 0.85 ms
                      ;data is at least 850us

movlw d'115'          ;see if data pulse is under 1150us
subwf Timex,w
btfs STATUS,0
goto SetOne            ;carry set means data > 1.150ms
                      ;data bit is one if 1.15 ms > data > 0.85 ms
                      ;data is invalid if over 1.15 ms
```

### SetZero

```
rlf      DataBuf,f      ;shift bits left one place
bcf      DataBuf,0      ;place the current bit
decfsz BitCount,f     ;update number of bits to go
goto   GetaBit          ;and get the next one
goto   EndData           ;but Wrap up if done
```

### SetOne

```
rlf      DataBuf,f      ;shift bits left one place
bsf      DataBuf,0      ;place the current bit
decfsz BitCount,f     ;update number of bits to go
goto   GetaBit          ;and get the next one
goto   EndData           ;but Wrap up if done
```

### EndData

;validate, move data from buffer to control

### Outputs

```
btfs  DataBuf,2        ;call for heat?
goto  ValidData         ;if no, data OK
btfc  DataBuf,1        ;if yes, call for A/C?
goto  MAIN              ;ignore simultaneous calls for heat and cool
```

### ValidData

```
movf  DataBuf,W
movwf OUT
return
```

## SET OUTPUT CONTROL

**FIGURE 7**

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HiTime			;HiTime times high level in units of 10us ;until transition to low level is found.
	clrf Timex		;reset timer
Hitest	btfss Input		;test com line for high level
	retlw 0x01		;transition to low occurred -normal exit
	nop		;add 1us
	btfss Input		;test com line for high level
	retlw 0x01		;transition to low occurred -normal exit
	btfss Input		;test com line for high level
	retlw 0x01		;transition to low occurred -normal exit
	incfsz Timex,f		;add a 10 us time unit to timer
	goto Hitest		;and continue checking input
	retlw 0x00		;exit with time exceeded code
LoTime			;LoTime times low input level in units of
10us			;until transition to high level is found.
	clrf Timex		;reset timer
Lotest	btfsc Input		;test com line for low level
	retlw 0x01		;transition to high occurred -normal exit
	nop		;add 1us
	btfsc Input		;test com line for low level
	retlw 0x01		;transition to high occurred -normal exit
	btfsc Input		;test com line for low level
	retlw 0x01		;transition to high occurred -normal exit
	incfsz Timex,f		;add a 10 us time unit to timer
	goto Lotest		;and continue checking input
	retlw 0x00		;exit with time exceeded code

**FIGURE 8**

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:100000000000FF0FFF0FFF0FFF0FFF0FFF0FFF0F8E  
:10001000FF0FFF0FFF0FFF0FFF0FFF0FFF0F4B0A29  
:1000200043006F007000790072006900670068008B  
:1000300074002000320030003000330020006200E5  
:100040007900200044004800530000020004300D5  
:1000500038002D003000380030003500300033000B  
:100060002000420041005300450000020006600CF  
:100070006F007200200043004F004D004600590001  
:100080002D0053005400410054002000280054006B  
:100090004D00290000009F0C02006600200C0600A5  
:1000A0008307550A69006800040083065F0A080593  
:1000B0000A0C29007800860546040604260404007C  
:1000C00083090807670AE902730A08048604180608  
:1000D000260518072604580646055807460438061C  
:1000E0000605380706047D095F0A200C34007500F8  
:1000F000F502780AF402770A0108400C3600750907  
:10010000F6027F0AFF087800A607830A030C320074  
:100110007100C509D1014306830A800C90000307D2  
:10012000830AAC0C90000306830AD009D101430670  
:10013000830A280C90000307830A3C0C90000306F6  
:10014000830AC509D1014306830A280C90000307DE  
:10015000830A3C0C90000307B60A550C9000030775  
:10016000830A730C90000307BB0A830A7803180400  
:10017000F202950AC00A78031805F202950AC00A2D  
:100180005807C40A3806830AFF087000A60701084A  
:100190000000A6070108A6070108F003C60A000828  
:1001A0007000A60601080000A6060108A6060108C0  
:0601B000F003D10A000873  
:021FFE00EE0FE4  
:00000001FF

**FIGURE 9**

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:1000000000000F28820764340A344320382035204A :10039000CD003530CE006230CF005019080041301A  
:100010006220342031203120392034200020A001FA :1003A000C7005530C8005430C9004F30CA0008009B  
:10002000850107309F0003138316203085003D3083 :1003B0002030C000C100C2004830C3004530C40036  
:10003000860081138312031385018601DE01DE0A27 :1003C0004130C5005430C6002030C7004D30C80051  
:100040005158515D90101301C22A10002301C22A2 :1003D0006F30C9006430CA006530C8002030C00DB  
:10005000D00F2B281430FB0003301C22D00F312886 :1003E000CD00CE00CF0050180800D01C002A4330AA  
:100060000301FC000F30D300D80088200530A02009 :1003F000C3004F30C4004F30C5004C30C600080069  
:10007000DE0BA628831203134E2271217223C307C :100400002030C3004F30C4004F30C5004630C6001F  
:10008000A020B622B02072227830D0E0B6225620A0 :10041000080083169B008312500883169A001C154F  
:10009000B020A11D4D28A1115228581953285818D5 :100420008B1355309D00A309D009C148B179C188F  
:1000A0005328D81C72226620A5203828A0112012BF :10043000172A1C118312080083169B001C141A082B  
:1000B007B082A0203195D2861287C082B0203199A :100440008312D0000800P700093C031C282A2B2A3D  
:1000C0008000318A015031C20160800211C78281E :100450007708373E0800770830E0800F600F001C4  
:1000D000A0186628201C7228201A8A2820198A280D :10046000F101F201F301F40173080220F60203180E  
:1000E00020108728201E8A2820198A282014872873 :10047000492A703084007308840774088000730868  
:1000F000A11C902820187028A01D822820198A2869 :10048000220F6077308013C03194B2AF30AF40112  
:10010000A0148728A01C8A2820198A28A010BF3094 :10049000342AF40A342A7608F2000800B022B02286  
:10011000D4002015201D0800D40800802011080071 :1004A000B02285100510AB223830A5009822A52275  
:100120002010A0108728D30B98281430D300DA238E :1004B000B0223830A5009822A522AB223830A50002  
:100130002030DA00DB01D80B9828D0A89A28013434 :1004C0009822A522AB222830A5009822A522AB2293  
:10014000DF009320DF0BA1280082830D5000B2307 :1004D0002830902201309022013090220630902259  
:100150009320D508A728D80B08003C30D800CC2B17 :1004E000B22080005108510AB22803090228514C0  
:100160004330B0004F30B1004D30B2004630B300E4 :1004F000AB22303084000008831390223F30040286  
:1001700059308400203085005430B6004530B700D7 :100500000319882A4F30040203190800840A7B2A41  
:100180004D30B8005030B9002030BA00BB00C0080 :100510008510AB22C03090228514840AAB227B2A3E  
:100190004D30C0002A082B2271080319D128710899 :10052000A5009822A522A50E9822A522AB2208009C  
:1001A0002322720823226F30C1006430C200653000 :100530008513251A85170513A51A05178613251B7C  
:1001B000C3003A30C4004F30C5004630C600463058 :1005400086170613A51B06170800051400000000F7  
:1001C000C7002030C800C900CA00CB00CC00CD0059 :100550000510AB2208003830A300A30BAD2A080019  
:1001D000CE00CF0004D2226082E2270080319F22860 :100560002930A400AB22A408B22A0800AC01AA01D6  
:1001E0002322BB007008031DF82871080319FB289F :10057000AB0105110000851185150830AC00AB01F9  
:1001F00071082322800031372082322BD002E3095 :10058000CA222B08A00AA030430AC00AB01CA227D  
:10020000BE003030A71D05293530BF00211C132941 :1005900005150800AB0D8511000085152B10851A77  
:100210004830C5006530C6006130C7007430C80082 :1005A0002B14AC08CA2A0800F522203EA60000231B  
:10022000201837292E29A11C20294330C5006F3002 :1005B0002808A6072A082A072A07A7002B08AA0046  
:10023000C6006F30C7006C30C800A01837292E29BF :1005C000F522AB0000232808AB072A08023C0318D9  
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:100250002030C8004F30C9004E30CA00A01E3629D9 :1005E000271E0800A60A271208002A082A07AA07B9  
:100260005730CD007230CE006D30CF0008006930BD :1005F00000232A082A07AA0728082807280708002E  
:10027000C9006E30CA006730CB002E292A30B0008A :100600000530A801A80AAA0203190A2B03180222B15  
:100280005330B1004530B2005430B3002A30B8004CE :10061000A803AA070800A013061C362B861E692B08  
:100290002030B5002030B500C000C100C200C3004E :10062000061E682B861D172B061DB2C808000130EB  
:1002A000C400C500C600C700C800C900CA00CB0012 :100630001C227121B1217222D1231E30DC009320B3  
:1002B0000800A01B66295230B80004130B10049301F :1006400086192A2BDC081F2B0430D0062017B12172  
:1002C000B2005330B3004530B4004A294C30B0007E :1006500072221D2B3C30DC009320861D242BDC0BEA  
:1002D0004F30B1005730B2004530B3005230B40057 :100660002C2BAl15DCOA201F08005B2B01301C225B  
:1002E0004A292A30B0002030B1004330B2006F30CC :100670007121D8217222D1231E30DC00932006186C  
:1002F000B3006D30B84006630B5007930B6005330CD :10068000512BDC0B3E2B5018492BD0184C2B5014FF  
:10030000B7007430B8006130B9007430BA002030E2 :100690004D2B0330D0064D2BD0102017D8217222BD  
:10031000BB005430B004D30B002030BEE002A3040 :1006A0003C2B5030DC009320061C432BDC0B532BDF  
:10032000BF002030C000C1004130C2003530C300E2 :1006B000DC0201F080020130730A1045006A10601  
:100330003030C4003030C5002030C6004330C70024 :1006C00001300922A115A01FB03A012D9010800CC  
:100340006F30C8006E30C9007430CA007230CB0004 :1006D000A017A1157B08AA00A01AAA037C08AB00EA  
:100350006F30C006C30CD002030CE002030CF008C :1006E000080203E217222D1231430DC009320A01BC5  
:100360000800A1152030C000C100C2004630C30003 :1006F0007E2B861AA22BDC08762B822B061AA22BC2  
:100370004130C4004E30C5002030C6004F30C700A9 :100700000DC0B762B63230430A01B8D2BFC077C1E97  
:100380004E30C8002030C900CA00CB00CC00763007 :10071000992BFB0AFC017B13992BFC020318992BE4

FIGURE 10